requires that precise diode pitch be maintained across the entire array. The smaller the diode pitch, the more problematic this becomes. Thin submounts must be used to achieve a tight diode-to-diode pitch (e.g., 250 micron thick submounts commonly used to achieve 400 micron diode pitch). As a result, the contact area between the submounts **52** and the substrate **56** is relatively small. While small variations in the thicknesses of the material (e.g., diode, submount or solder) will have minimal effect on the diode pitch, the tolerance stack up may result in considerable misalignment of the submounts **52** to the solder pads **62***a*-**62***g* on the substrate. For instance, a 2.5% variation in material thickness on a 400 micron pitch array results in up to a 22% reduction in total bonding area for a 10-bar array, a 32% reduction for a 15-bar array and a 36% reduction in total bonding area for a 20-bar array. Moreover, a single submount could be misaligned by as much as 40%, 60% or 80% respectively for a 10-, 15-, or 20-bar array even though the pitch is only off by 2.5%. This may have a significant effect on the performance and reliability of the array since the direct thermal path from the diodes **54** is through the bond. As shown in FIG. **1**B, the solder bonds **62***c*-**62***g* become increasing misaligned with the corresponding submounts **52** and therefore the area of thermal conductivity between the submounts **52** and the substrate **56** is reduced, thereby compromising the heat removal from the diodes **54**.

[0014] Thus, there is a need for a laser diode array without an electrically isolating substrate that maintains electrical isolation between the submounts and the underlying heat exchanger. There is also a need for a laser diode array that insures the necessary solder bonds between the submounts and the heat exchanger. There is also a need for a laser diode array having solder bonds between submounts and the heat exchanger that provide maximum surface contact for thermal transmission.

SUMMARY

[0015] According to one example, a laser diode array includes a plurality of laser diode bars and a plurality of submounts supporting one of the laser diode bars. At least one of the plurality of submounts includes an electrically insulative submount core having a top surface, an opposite bottom surface, and first and second side surfaces. A first electrically conductive layer covers only a part of a first side surface thereby leaving an exposed area of the first side surface adjacent to the bottom surface. The first conductive layer is in electrical contact with one of the respective laser diode bars. A second electrically conductive layer covers only a part of a second side surface thereby leaving an exposed area of the second side surface adjacent to the bottom surface. The second electrically conductive layer is in electrical contact with another one of the respective laser diode bars. An electrical connector is located between the first and second electrically conductive layers. A metallic heat exchanger is in thermal contact with the bottom surface of each of the submount cores.

[0016] Another example is a laser diode package to be used in a laser diode array having a plurality of laser diode packages. The laser diode package has a submount having an electrically insulative core with a top surface, a bottom surface, and first and second side surfaces located between the top and bottom surfaces. The submount has a continuous electrically conductive layer positioned on the top surface and on portions of the first and second side surfaces adjacent to the top surface. A lowermost end of the continuous electrically conductive layer on each of the first and second side surfaces is spaced away from the bottom surface of the electrically insulative core. A laser diode bar is attached via a solder bond to the first side surface such that the laser diode emits energy from a region adjacent to the top surface.

[0017] Another example is a laser diode array including a plurality of laser diode packages. Each of the packages include a submount having an electrically insulative core with a top surface, a bottom surface, and first and second side surfaces located between the top and bottom surfaces. The submount has a continuous electrically conductive layer positioned on the top surface and on portions of the first and second side surfaces adjacent to the top surface. A lowermost end of the continuous electrically conductive layer on each of the first and second side surfaces is spaced away from the bottom surface of the electrically insulative core. A laser diode bar is attached via a solder foil layer to the first side surface such that the laser diode emits energy from a region adjacent to the top surface. A thermal reservoir is thermally coupled to the bottom surfaces of each submount via a lower temperature solder than the solder foil layer.

[0018] The above summary of the present invention is not intended to represent each embodiment or every aspect of the present invention. The detailed description and Figures will describe many of the embodiments and aspects of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The foregoing and other advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings.

[0020] FIG. **1**A is a cross-section view of a prior art laser diode mounting system having multiple substrates;

[0021] FIG. **1**B is a cross-section view of a prior art laser diode mounting system with a single substrate showing the potential for misalignment due to tolerance stacking;

[0022] FIG. **2** is view of a laser diode array assembly using isolated submounts without a substrate layer;

[0023] FIG. **3**A is a side view of the isolated submounts and laser diode bars in the system in FIG. **2**;

[0024] FIG. **3**B is an exploded view of the components of an isolated submount and laser diode bar in FIG. **3**A;

[0025] FIG. **4** is a side view of an alternate isolated submount and laser diode bar suitable for use in the system in FIG. **2**; and

[0026] FIG. **5** is a cross-section view of another alternate isolated submount suitable for use in the system in FIG. **2**.

[0027] While the invention is susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and will be described in detail herein. It should be understood, however, that the invention is not intended to be limited to the particular forms disclosed. Rather, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0028] FIG. **2** is a perspective view of a laser diode array system **100** allowing transverse emission of light from laser diode bars **104** supported by submounts **102**. The laser diode